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Description

Method for transmit power compensation in a mobile
communication terminal, and a communication terminal
5 for implementing said method

The invention relates to a method for transmission
power adjustments for a mobile communications terminal,
which is designed with a power amplifier whose output
10 signal amplitude depends on the frequency of an input
signal to the power amplifier, and for operation in at
least one standard mobile radio frequency band
wherein

the at least one standard mobile radio frequency range
15 is subdivided into two or more frequency intervals, and
power adjustment is carried out in each case for at
least some of the frequency intervals,
and wherein the power adjustment is carried out in such
a manner that the RF power is essentially independent
20 of the frequency of an input signal to the power
amplifier. The invention also relates to a
communications terminal by means of which the method
for transmission power adjustment can be carried out.

25 A method or a communication terminal such as this is
known from WO 01/84741.

In addition, EP 0 692 885 A1 a method for transmission
power adjustment for a mobile communication terminal,
30 which is equipped with a power amplifier, whose output
signal amplitude depends on the frequency of an input
signal to the power amplifier, an RF connector, an

internal antenna and a connection for an external antenna, and for operation in at least one standard mobile radio frequency band, wherein the at least one standard mobile radio frequency band is

subdivided into two or more frequency intervals, and power adjustment is carried out for each of at least some of the frequency intervals.

- 5 The method described above is known from EP-0 692 885 A1, where frequency intervals are referred to as individual radio channels.

10 In order to set up a communication link by means of mobile radio terminals as an example of mobile communications terminals, it is necessary for the electromagnetic waves to be transmitted via antennas to the communications terminals. The electromagnetic fields which are involved for the transmission of
15 electromagnetic waves also penetrate into human tissue, for example in the situation when a user of a communications terminal is holding the terminal against his ear. This leads to a thermal load on the human tissue, which must be kept within permissible limits.
20 One measure for assessment of the thermal load is the so-called "SAR value", with the abbreviation "SAR" standing for

In contrast, it has not yet been possible until now to consider the possibility of power adjustment deliberately in order to optimize the SAR value.

5 Against this background, the invention is based on the object of specifying a method for power adjustment for a mobile communications terminal, in which the SAR value can be effectively optimized. A further aim is to provide a communications terminal for carrying out the
10 method.

The object mentioned above is achieved with regard to the method by a method for transmission power adjustments as claimed in patent claim 1.

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According to the new method, this means that, in contrast to the previous situation, in which power adjustment can be carried out only for the entire frequency band, power adjustment is additionally
20 carried out on a frequency-interval specific basis. The frequency intervals may have the same constant width, or a varying width.

This makes it possible likewise to adjust the power
25 particularly for the central frequency intervals, which in fact makes it possible to reduce the SAR value of the central frequency intervals, and thus to optimize it.

thus resulting in a situation in which the SAR value is of particular importance.

5 In one preferred embodiment of the method, the power adjustment when using the internal antenna can be carried out such that the emitted power level from the mobile communications terminal is essentially independent of the frequency of the input signal to the power amplifier. This means that the output power from
10 a transmission antenna for the mobile communications terminal is independent of frequency. This has the advantage that, for example, weak channels at the edge of the standard mobile radio frequency band have their power increased, to produce an improved communication
15 link for an uplink connection to a base station.

The power is adjusted in a particularly advantageous manner by giving priority to the optimization of the SAR value over the at least one standard mobile radio
20 frequency band.

It should be stressed that the method can, of course, also be carried out for transmission power adjustment for a mobile communications terminal which can operate
25 in two or more standard mobile radio frequency bands. In this case, two or more reference tables, for example, are provided, and are used in the manner described above.

30 The object as mentioned above is achieved with regard to the communications terminal by a mobile communications terminal as claimed in patent claim 4.

output power for two or more frequency intervals in the at least one standard mobile radio frequency band.

The major features of the communications terminal are
5 that the required means for respective power adjustment are provided for individual frequency intervals in a standard mobile radio frequency band. These means may be the already described reference table. The use of an antenna detector allows different reference tables to
10 be used for power adjustment for different operating conditions of the mobile communications terminal, with the operating conditions being distinguished on the basis of whether the antenna is external or internal.

15 It should be mentioned that the software-implemented solution in which a reference table is used will undoubtedly be the more cost-effective, and is thus preferred overall.

20 Exemplary embodiments of the invention will be described in the following text with reference to the drawings, in which:

Figure 1 shows the typical frequency profile of the
25 emitted power from an antenna for a mobile communications terminal with a standard input signal amplitude;

Figure 2 shows a schematic block diagram of a
transmission output stage of a mobile
30 communications terminal, by means of which power adjustment can be carried out for individual frequency intervals, and

Patent Claims

1. A method for transmission power adjustments for a
5 mobile communications terminal, which is designed with
a power amplifier whose output signal amplitude depends
on the frequency of an input signal to the power
amplifier, and for operation in at least one standard
mobile radio frequency band,
10 wherein
the at least one standard mobile radio frequency band
is subdivided into two or more frequency intervals, and
one power adjustment operation is carried out in each
case for at least some of the frequency intervals
15 and wherein the power adjustment is carried out in such
a way that the RF power is essentially independent of
the frequency of an input signal to the power
amplifier, characterized in that
the power adjustment is carried out on the basis of
20 measurements by an antenna detector which determines
whether an internal antenna or an external antenna,
which can be connected via an RF connector for the
external antenna, is being used,
when the external antenna is being used, the power
25 adjustment is carried out in such a way that the RF
power which is applied to the RF connector is
essentially independent of the frequency of an input
signal to the power amplifier, and
when using the internal antenna, the power adjustment
30 is carried out in such a way that the power emitted
from the mobile communication terminal is essentially
independent of the frequency of an input signal to the
power amplifier.

2. The method as claimed in claim 1,
characterized in that
the power adjustment operation for the frequency

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intervals is carried out by access to at least one reference table, in which an adjustment factor is associated with each frequency interval.

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3. A mobile communications terminal having a power amplifier whose output signal amplitude depends on the frequency of the input signal to the power amplifier,
5 and having a device for power adjustment for the output power from the communications terminal in at least one standard mobile radio frequency band, wherein the device for power adjustment is designed to adjust the output power for two or more frequency intervals
10 (1; 2; 3; 4; 5; 6) in the at least one standard mobile radio frequency band in such a way that the output power is essentially independent of the frequency of an input signal to the power amplifier, characterized in that
15 an RF connector, an internal antenna and a connection for an external antenna are provided, the device for power adjustment is connected to an antenna detector (D) in the mobile communication terminal, which determines whether the internal or the
20 external antenna is being used, the device for power adjustment is controlled in such a manner that the RF power which is applied to the RF connector is essentially independent of the frequency of an input signal to the power amplifier, and the
25 device for power adjustment is controlled in such a way that, when the internal antenna is being used, the power adjustment is carried out in such a way that the power emitted from the mobile communication terminal is essentially independent of the frequency of an input
30 signal to the power amplifier.

4. The communications terminal as claimed in claim 3, characterized in that

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the device for power adjustment has at least one software-implemented reference table (V1; V2), in which an adjustment factor is associated with each frequency interval (1; 2; 3; 4; 5; 6).